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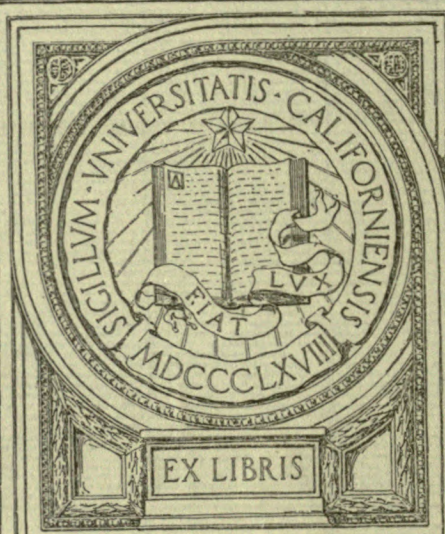
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BULLETIN No. 1.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

MEMORANDUM ON THE PRESERVATION OF TIMBER IN COAL MINES.

At the present time the shortage of timber supplies has rendered the prevention of wastage in pit timber a matter of national importance. A large amount of timber in mines, and especially in shallow coal-pits, requires to be replaced prematurely because it undergoes decay and consequently collapses. Such decay or disintegration is, at least for the most part, caused by various fungi which permeate and devour the wood, and often clothe its surface with a fluffy or cottony material ("spawn"). This spawn, usually white but sometimes coloured, can rapidly grow over the timber, walls or floor, and may even be broken off and transferred elsewhere, and thus reach and infect sound wood.

These wood-destroying fungi also produce fructifications, which emit countless microscopic germs ("spores"), which, conveyed through the air, may alight on, and attack, pit-wood.

Two means of preventing loss through the decay of wood are possible: *preventive* and *remedial* measures.

Thorough *preventive* measures are largely impracticable at present owing to difficulties as regards machinery, materials and skilled labour. On the other hand, *remedial* measures may be undertaken at once; and it is the main object of this Memorandum to point out what they are, and how they should be employed.

A. *Remedial measures* are designed to decrease the amount of infection, so that the life of pit-timber will be *lengthened on the average*, and a corresponding saving be thereby accomplished.

Growth of the spawn over the surface of the timber, walls or floor to sound wood is one means of rapid spread of infection, and is aided by the transference of the spawn by other agencies (wind-currents, on men's clothes, packing of rejected pit-wood close to sound wood, &c.). The checking of this superficial growth cannot do more than diminish the rate of decay of the timber, because the wood-attacking fungi grow also inside the timber; but inasmuch as the fungus grows more rapidly outside than inside the wood, the rate of destruction of pit-wood will be decreased by killing spawn on the surface.

Infection will likewise be decreased by the removal and destruction of the germ-producing fructifications that emerge from the wood.

In order to accomplish these ends—

1. Colliery timber men should be taught to recognise the spawn and fructifications.

2. *Starting from the intake*, and travelling with the air currents to the return ways, the timber should be periodically inspected for fungus-material on the timber. Where fungus occurs, the accessible pit-wood should be treated as follows:—

(*a*) The apparatus required would be a pail, some cloths, a cloth or cotton swab, a strong knife, and an antiseptic solution properly made up.

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(*b*) The following antiseptic substances are suitable and are arranged in order of preference :—

(i) Creosote, and various derivatives.*

(ii) Zinc Chloride.

(iii) Copper Sulphate (which should not be used where the mine-water is rich in iron).

(*c*) Every fructification (shaped like a cushion, bracket or mushroom) should be removed by cutting away the portion of wood to which it is attached. These should be placed in the pail, carried to the surface, and burnt in the boiler fires. All waste timber lying in the roadways and recesses should also be brought to the surface and burnt at once. Instant burning is important, as a good deal of infection of sound timber takes place during storage above ground because decaying wood is allowed to lie about amongst it, and so the infection is spread to timber originally sound.

The result of this would be to stop much of the infection that is caused by microscopic germs (spores).

(*d*) At the same time or subsequently, the spawn on the surface of the pit-timber would be dealt with as follows. Each man engaged would carry a swab, the cloths and a pail three-quarters full of the antiseptic solution chosen. All the accessible wood, including props, balks, crown-trees, bars and collars, would be washed with the solution, and the spawn removed. The solution and cloths would require to be renewed from time to time. When possible, loose bark should be removed and the bare wood washed over with the solution.

This treatment would serve both to check the growth of spawn over the surface and to prevent its transference from one part of the mine to another, and thus would hinder new infections. But a certain amount of the antiseptic solution would be absorbed by the wood, and on drying would leave on or near the surface a thin film of antiseptic substance which would check the growth of any germs that might alight on the wood.

A great deal will depend on the thoroughness with which these operations are carried out. When once begun the treatment should be systematically and regularly pursued, as these wood-attacking fungi grow rapidly and temporary neglect may undo the work of months. The mine-timber should therefore be examined at least once a month. The consequence of the treatment will be a steady improvement in the condition of the mine-timber from the very commencement. It will, however, be evident that one limitation to the beneficial effects will be due to the inaccessibility of decaying wood packed under the roof above the balks, crown-trees, bars or collars.

B. The methods detailed above constitute a *direct attack on the wood-destroying fungi*, and are designed to reduce the loss occasioned by decay in mines that are already infected. An entirely different method of dealing with the problem is a defensive one, and involves the *protection of the wood* by rendering it immune to infection by fungi.

Wood can be protected more or less perfectly from decay-inducing fungi by coating or impregnating it with an antiseptic substance. The degree of protection thus afforded depends upon the substance used and upon the depth to which it penetrates the wood. Mere superficial coatings are less efficient than injections to some depth within the surface; while perfect protection is ensured solely by impregnating the wood throughout.

Various substances are very unequal in their power of conferring upon wood resistance to fungal attack. In some coal-pits mere soaking with mine-water lengthens the life of the wood; at the opposite extreme of efficiency is creosote, which confers indefinitely long durability upon wood. The exact treatment to be adopted will depend therefore on the circumstances of the case and particularly upon the time during which the wood is required to remain sufficiently sound to be of service.

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* Competent advice should be sought as to these.

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Superficial washes are applied by means of a brush; and when this or any other method of application of the antiseptic is adopted, bark must be removed from the timber before treatment. Somewhat deeper penetration is ensured by soaking the wood for a longer or shorter time in the heated antiseptic solution. For this purpose, timbers, before being taken down into the pit, should be soaked for at least 15 minutes in a tank of 10 per cent. zinc chloride at a temperature of 130° F., or in creosote as hot as it can conveniently be used. When the props are put in position in the ways, their tops where bruised by the hammer should be painted over with the preservative, as infection often starts at these spots. For deeper penetration, more prolonged soaking is essential, and the deepest penetration is ultimately secured with greatest economy by pneumatic pressure (and the use of a creosoting plant) if large quantities of wood require treatment.

Creosote and its derivatives, or zinc chloride, represent the most economic and efficient antiseptics for use in mines. But a number of salts confer feebler resistance, and may be used where the wood has to last only a relatively short time before being removed; among these are common salt, magnesium sulphate, certain mine-waters, copper sulphate (not to be used where the mine-water is rich in iron): *iron sulphate*, sometimes recommended, *should not be used.*

This policy of replacing timber in mines by wood rendered more or less antiseptic should be followed in all cases. When carried out in the most thorough manner, it gradually brings the pit into a completely sanitary condition (for instance, thoroughly creosoted pit props that when unprotected collapse from decay in a few weeks will last for many years; discarded creosoted railway sleepers similarly will serve for indefinite periods as sound cross bars).

The precise method of dealing with mines in order to eradicate or decrease decay of timber will vary somewhat in detail in different cases. In regard to this, advice may be obtained from the Department of Scientific and Industrial Research.

Note.

The significance of wood-attacking fungi (and possibly certain bacteria) is not confined to their destruction of timber, for during their growth they may produce " black damp," and the amount of this gas that they produce is directly proportional to their abundance and vigour.

PERCY GROOM.

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